MONTANA BOARD OF ENVIRONMENTAL REVIEW'S WRITTEN FINDING, PURSUANT TO SECTION 75-2-207, MCA (HOUSE BILL 521), FOR AMENDMENT AND ADOPTION OF RULES TO CONTROL EMISSIONS OF MERCURY FROM COAL-FIRED ELECTRIC STEAM GENERATING UNITS MAR NOTICE NO. 17-246

Section 75-2-207, MCA, of the Clean Air Act of Montana (CAAM), implements House Bill 521 (HB 521) from the 1995 Montana Legislature. Pursuant to Section 75-2-207, MCA, the Board of Environmental Review ("Board") may adopt a rule to implement the CAAM that is more stringent than comparable federal regulations or guidelines only if:

A public hearing is held;

Public comment is allowed; and

The Board makes a written finding after the public hearing and comment period that is based on evidence in the record that the proposed standard or requirement:

protects public health or the environment;

can mitigate harm to the public health or the environment; and

is achievable with current technology.

A written finding pursuant to Section 75-2-207, MCA, must reference information and peer-reviewed scientific studies contained in the record that form the basis for the Board's conclusion. The written finding must also include information from the hearing record regarding costs to the regulated community that are directly attributable to the proposed standard or requirement.

In this proceeding, the Board is amending and adopting rules to establish restrictions on emissions of mercury from coal-fired electrical generating power plants (EGUs), and the U.S. Environmental Protection Agency (EPA) has promulgated a federal regulation, titled by EPA as the Clean Air Mercury Rule (CAMR), that also provides for regulation of mercury emissions from the same facilities. 70 Federal Register 28,606 (May 18, 2005). However, it's not clear that HB 521 applies to the amendments and new rules adopted by the Board, and the Board believes that it may not apply.

For simplification, the rule amendments and new rules adopted by the Board to regulate mercury emissions from EGUs are referred to below as "the Board's mercury rules."

CAMR May Not Be Comparable To The Rules Adopted By the Board

HB 521 applies only when there is a comparable federal regulation or guideline. It's not clear that CAMR is comparable to the rules adopted by the Board.

CAMR establishes:

> A national cap on mercury emissions from EGUs (40 CFR 60.24(h)(3));
>
> State mercury budgets for EGUs that may not be exceeded (except through emission allowance trading) (40 CFR 60.24(h)(3));
>
> New Source Performance Standard (NSPS) emission limits for new EGUs that may not be exceeded (40 CFR 60.45a);
>
> A model cap and trade program that applies to both new and existing sources (40 CFR Part 60, Subpart HHHH); and
>
> Compliance, monitoring, recordkeeping, and reporting requirements (40 CFR 60.48a, 60.49a, 60.50a, 60.51a, 60.52a; 40 CFR 60, Appendix B, Performance Specification 12A; 40 CFR 72.2; and 40 CFR Part 75).

The rules adopted by the Board are more comprehensive than CAMR in that they include emission limits for existing EGUs, as well as for new EGUs, which is a major difference from CAMR. The emission limits in CAMR apply only to EGUs for which construction or reconstruction commenced or commences after January 30, 2004. 40 CFR 60.45a. This is significant for Montana because there are four existing EGUs in the state that are subject to the state mercury budget, including the PPL-Montana Colstrip Steam Electric Station, which is the second largest EGU west of the Mississippi River. Under CAMR, mercury emissions from these existing EGUs would not be subject to any emission limits but, rather, would be limited only by the state EGU mercury budget, which could be expanded with purchases of emission allowances from out of state. Also, the CAMR national and state mercury budgets for 2010-2017 are intended to reflect the existing emissions of EGUs that include the co-benefit of control for criteria pollutants, without requiring implementation of additional pollution control for mercury.

Also, while CAMR specifies state EGU mercury budgets and emission limits for new EGUs and includes a model mercury emission allowance trading program (40 CFR Part 60, Subpart HHHH) that states may adopt to demonstrate compliance with their budgets and that will be automatically approved by EPA if adopted by a state, CAMR requires only: that each state having an EGU mercury budget submit to EPA, for its approval, some form of state plan that demonstrates that the state will comply with its budget; and that each such state require compliance with the monitoring, recordkeeping, and reporting requirements specified in CAMR. Much of CAMR merely specifies the minimum requirements for these state plans.

40 CFR 60.24(h)(3) and (4), of CAMR, state in relevant part:

> (3) The State's State plan under paragraph (h)(1) of this section shall contain emission standards and compliance schedules and demonstrate that they will

> result in compliance with the State's annual electrical generating unit (EGU) mercury (Hg) budget for the appropriate periods. . . . .
>
> (4) Each State plan under paragraph (h)(1) of this section shall require EGUs to comply with the monitoring, record keeping, and reporting provisions of part 75 of this chapter with regard to Hg mass emissions.

In the preamble to CAMR, EPA stated that:

> States have the flexibility to meet these State budgets by participating in a trading program or establishing another methodology for Hg emissions reduction from coal-fired electric generating units, as discussed elsewhere in this action. States have the ability to require reductions beyond those required by the State budget.

70 Fed. Reg. 28,621 (May 18, 2005).

So, the regulatory scheme established pursuant to CAMR is much different than the typical federal regulation or guideline. For example, a typical New Source Performance Standard establishes stringent emission limits and requirements for monitoring and demonstrating compliance with the standard, and states are required to revise their state implementation plans to demonstrate compliance with the standard. CAMR merely establishes a ceiling on emissions of mercury from EGUs, requires each state having an EGU mercury budget to develop a state plan to demonstrate compliance with its budget, and establishes a model rule that constitutes an option, among many available options, to demonstrate compliance with a state's budget. Also, as noted above, in promulgating CAMR, EPA expressly contemplated that states should have the ability to require reductions beyond those required to by their budget. So, it's not clear that CAMR can be compared to a particular state plan developed to demonstrate compliance with CAMR, and the Board believes that CAMR may not be comparable to the plan it has adopted.

The Rules Adopted by the Board May be Viewed as Not Being More Stringent than CAMR

HB 521 also applies only to adoption of a state rule that is more stringent than a comparable federal regulation or guideline. For the same reasons that it's not clear that the rules adopted by the Board are comparable to CAMR, it's also not clear that the rules adopted by the Board are more stringent than CAMR. CAMR expressly specifies that a state may adopt different or more stringent provisions, as long as the state rules provide for compliance with the state's EGU mercury budget and require compliance with the monitoring, record keeping, and reporting provisions of 40 CFR Part 75. As shown above, EPA expressly provided in CAMR for states to require reductions beyond those required by their budgets, if they choose to do so.

So, the only real requirements of CAMR for state rules are compliance with CAMR's state budgets and monitoring, recordkeeping, and reporting requirements, and it's not clear that the stringency of the Board's mercury rules can be compared to the stringency

of CAMR. Therefore, HB 521 may not apply to the rules adopted by the Board, and it may be that no further analysis is required under HB 521. However, the rules adopted by the Board meet the criteria specified in HB 521 for the Board to adopt rules that are more stringent than a comparable federal regulation or guideline.

The Board Held Public Hearings and Provided the Opportunity for Public Comment

On May 4, 2006, the Board published a Notice of Proposed Amendment and Adoption for this rulemaking in the Montana Administrative Register. 2006 MAR, Issue No. 9, p. 1112. The Board held two public hearings on the proposed rulemaking in the two largest Montana cities nearest to the sites of existing and proposed EGUs. The Board held the first hearing in Great Falls on May 31, 2006, and held the second hearing in Billings on June 1, 2006. The notice of proposed rulemaking notified the public of the opportunity to submit written comments to the Board through July 6, 2006, and the Board provided the public the opportunity to submit written and oral comments at the two public hearings. 2006 MAR, Issue No. 9, p. 1125.

The Rules Adopted by the Board Protect Public Health or the Environment

Mercury is a persistent bioaccumulative toxic metal that exists in three forms: elemental; inorganic compounds; and organic compounds (primarily methylmercury). Each form exhibits different health effects. Methylmercury, well-established as a neurotoxin, is formed by biological processes after mercury has precipitated from air and been deposited into water bodies. Mercury is toxic to humans and animals from both the inhalation and oral exposure pathways.

As with any other chemical, the toxicity of mercury is related to the amount of mercury exposure, i.e., the dose. However, not only is mercury toxic to humans and wildlife, but it can be toxic in extremely minute amounts. Researchers with the Mercury Experiment to Assess Atmospheric Loading in Canada and the United States (METALLICUS) concluded that a teaspoon of mercury in a 1200-acre lake can render the fish in the lake inedible. One seventieth ($1/70^{th}$) of a teaspoon of mercury can contaminate all of the fish in a 25-acre lake.

Humans and animals can absorb methylmercury from consumption of fish and other aquatic flora and biota contaminated with mercury, with fish consumption constituting the main pathway of exposure for both humans and wildlife. Aquatic mammals, such as mink and otter, and birds may be adversely affected by mercury contamination and by consumption of other animals that have consumed contaminated food.

There is a connection between exposure to mercury and neurological damage to children. Mercury readily crosses the placenta and newborns have higher levels of mercury in their system than their mothers. According to the National Academy of Sciences (NAS), chronic low-dose prenatal methylmercury exposure has been associated with poor performance by children on neurobehavioral tests, including tests that measure attention,

visual-spacial ability, verbal memory, language ability, fine motor skills, and intelligence. Mercury exposure also has been associated with attention deficit disorder, hyperactivity, learning disabilities, developmental delays, behavioral problems, and autism in children.

The toxicity of methylmercury to the developing brain was first recognized in the 1950s in Minimata, Japan, when pregnant women consumed fish from mercury-contaminated coastal waters, resulting in at least 30 cases of cerebral palsy in children born from these women. In a study of methylmercury poisoning that occurred in Iraq in 1972, it was found that mercury readily passes from mother to fetus and later can pass to an infant through a mother's milk and that some exposed children demonstrated gross impairment of motor and mental development. Children continue to be at risk after infancy from dietary exposure because their nervous systems still are developing and they eat more food relative to body weight than does an adult.

Researchers in a study of children in the Faroe Islands, where fish consumption is relatively high, found a correlation between relatively low levels of mercury and adverse health impacts. A study in the Seychelles Islands led to opposite results. However, the NAS concluded that the results of the Faroe Islands study were the more appropriate results for establishing a reference dose (RfD) for mercury below which adverse health affects are not expected to occur.

While, a variety of factors, including fish consumption rates, quantities of fish consumed, species of fish consumed, concentrations of methylmercury in fish consumed, and frequency of consumption affect an individual's methylmercury exposure, for the reasons stated above, women of childbearing age are regarded as the population of greatest concern. However, people who reside near EGUs and consume locally-caught fish and local wild game as a substantial portion of their diet are also a concern. Particular concerns were expressed in this rulemaking proceeding for tribal members who reside near EGUs and who may be more likely than members of other populations to consume locally-caught fish and game as a substantial portion of their diet.

Based on testing of over 1,500 women of child-bearing age, the U.S. Centers for Disease Control determined that about eight percent of the women of child-bearing age who were tested had levels of methylmercury in their blood that are at or above EPA's RfD of 0.1 ug/kg body weight per day. The women tested reported consuming more shrimp and tuna, i.e., seafood, than other fish and shellfish, however, freshwater fish from numerous water bodies in Montana also are known to contain high levels of mercury.

The North Carolina Environmental Quality Institute issued an interim report in February 2006 stating that, out of 2,834 hair samples from women of child-bearing age analyzed for mercury content, 640 of the women had mercury levels at or above EPA's mercury RfD. In a May 4, 2006, study of hair samples of 50 people in the Bozeman, Montana area, five of 39 adult women tested above EPA's RfD.

Based on testing of mercury levels in women of child-bearing age, as many as 1,822 babies of the 11,045 born each year in Montana could be at risk for developmental

problems due to mercury exposure while in the womb. This could negatively affect children's educational achievement, economic performance, and income and, if only 10% of these 1,822 babies born each year need special education, at a cost of an average of $5,900 per year, the cost for Montana would be $12,900,000 per year, according to one estimate.

Researchers, including researchers at the Center for Children's Health and the Environment at the Mount Sinai School of Medicine, have concluded that exposure to mercury causes lifelong loss of intelligence in hundreds of American babies born each year and that this loss of intelligence exacts a significant economic cost to American society. The total cost resulting from lost I.Q. points in the U.S. has been estimated at billions of dollars per year.

A study of the Harvard Center for Risk Analysis quantified the increases in children's I.Q., and corresponding benefits to society, that would result from decreasing mercury emissions from coal-fired power plants. The researchers found a correlation of .5 to 1 point I.Q. loss in children per one part per million of mercury in the hair samples of women and calculated that a 70% decrease in coal-fired power plant mercury emissions by 2018 would result in benefits to society of between $119 million and $288 million every year.

Based on epidemiological studies, the NAS estimated that many thousands of children are born in the U.S. each year at risk for adverse neurodevelopmental effects due to in utero exposure to methylmercury. The NAS has concluded that neurological change to children exposed to mercury will result in increased numbers of children requiring special education and remedial classes and that mercury exposure may also continue in infants through contaminated breast milk.

Researchers in Texas reported a correlation between increases in the rate of special education services and autism in the Texas counties studied and increases of mercury released into the environment in those counties.

In a Finnish study, 1,871 men were followed over an average duration of 13.9 years. Through linear regression analysis and other mathematical and statistical methods, the conclusions of the study were that a person in the top third of hair mercury content was 1.7 times more likely to have cardiovascular disease, 1.6 times more likely to die of a heart attack, and 1.4 times more likely for all-cause death. Other researchers also have hypothesized an association between methylmercury exposure and an increased risk of coronary disease in adults.

While many of the studies of the affects of mercury exposure on public health and the environment do not definitively establish a cause and effect relationship, or establish the source of the mercury contamination involved in the study, taken together, studies establish a basis to conclude that mercury exposure poses a significant risk to public health and the environment.

Approximately 420,000 acres of lakes and 1,300 miles of streams already are impaired in Montana due to mercury. There are statewide fish advisories for northern pike, lake trout, and walleye, due to mercury contamination. Advisories for these species, as well as for numerous other species with site-specific warnings, are shown in a brochure prepared by the Montana Department of Fish, Wildlife & Parks and the Montana Department of Public Health and Human Resources. In an EPA nationwide study of chemical levels in fish, large walleye from the Bighorn Reservoir, southwest of the PPL Colstrip facility, had some of the highest mercury levels out of more than 500 fish tissues sampled around the country.

In the last year, four bald eagles with mercury poisoning were found in Montana near Roscoe, Choteau, Hauser Lake, and Fort Benton. In a study of mercury levels in Montana's adult breeding loons, average levels were higher than levels found in loons breeding in other parts of the northwestern U.S.

The Rules Adopted by the Board Can Mitigate Harm to Public Health or the Environment

While a significant amount of mercury in the environment is from natural sources, such as forest fires, volcanic activity, and geothermal features, 70% of worldwide mercury emissions now are caused by human activity, and EGUs are the largest single source of manmade mercury emissions, accounting for about 48 tons of mercury emissions in 1999. U.S. anthropogenic mercury emissions are estimated to account for approximately three percent of the global total, and U.S. utilities are estimated to account for approximately one percent of total global emissions, with most of the mercury deposition in the U.S. estimated to originate from sources outside the U.S. However, Montana EGUs are responsible for most of the industrial mercury emissions in the state, representing approximately 92% of those emissions.

Existing EGUs in Montana, i.e., EGUs that have been constructed and have commenced commercial operation, and that would be subject to the Board's mercury rules include: PPL-Montana's 2,270-megawatt, pulverized coal (PC), subbituminous-fired, Colstrip Steam Electric Station near Colstrip, Montana; PPL's 171-megawatt, PC, subbituminous-fired, J.E. Corette Steam Electric Station at Billings, Montana; the Colstrip Energy LP 35-megawatt, PC, waste coal-fired, Rosebud Power Plant, near Colstrip, Montana; the Montana-Dakota Utilities Company's 50-megawatt, PC, lignite-fired, Lewis and Clark Station near Sidney, Montana; and the Centennial Power/Rocky Mountain Power 116-megawatt, PC, subbituminous-fired, Hardin Generating Station near Hardin, Montana. The PPL Colstrip facility is controlled with wet scrubbers; the J.E. Corette facility is controlled with an ESP, the Rosebud Power Plant is controlled with CFB boiler technology and a fabric filter; the Lewis and Clark Station is controlled with a wet scrubber; and the Hardin Generating Station is controlled with dry flue gas desulferization, fabric filter, and selective catalytic reduction.

The Department has issued a final air quality permit for and the 780-megawatt, PC subbituminous-fired, Bull Mountain Development Co. No. 1, LLC, Roundup Power

Project, to be located near Roundup, Montana. This facility would employ dry flue gas desulferization, fabric filters, and selective catalytic reduction.

The Department recently issued a draft air quality permit for the 250-megawatt, circulating fluidized bed (CFB), subbituminous-fired, Southern Montana Electric Generation & Transmission Cooperative, Inc., Highwood Generating Station, to be located near Great Falls, Montana. The draft air quality permit for that EGU requires an integrated emission control system that includes CFB limestone injection technology, a fabric filter, and selective non-catalytic reduction.

Great Northern Power has proposed a 500-megawatt, CFB, lignite-fired, EGU to be located near Circle, Montana. According to the U.S. Department of Energy (DOE), several other EGUs have been proposed for Montana.

In 2003, EGUs in the state emitted 986 pounds of mercury, representing 92% of the industrial mercury emissions in the state. The Colstrip facility emitted 850 of those pounds. Construction and operation of the Hardin, Roundup, Highwood, and Great Northern EGUs would almost double the current EGU megawattage in Montana, thereby, significantly increasing EGU mercury emissions in the state.

Many commenters stated that mercury emissions from Montana EGUs pose a significant threat to public health and the environment and that reducing mercury emissions from EGUs in the state will reduce the amount of mercury deposited in the state and, thereby, reduce the risk to public health and the environment. Commenters referred the board to studies that have indicated that there is a significant risk of local deposition of mercury emitted by EGUs.

Several years ago, the State of Florida issued fish consumption advisories for the Everglades because of high levels of mercury in the fish in that area. Reductions in total mercury emissions in South Florida since the late 1980s have been paralleled by significant reductions of mercury levels in fish tissue and in bird feathers.

Several years after the State of Massachusetts enacted restrictions on mercury emissions from incinerators, the mercury levels in yellow perch in eight nearby lakes dropped significantly. Farther away from the emission sources, within the state, there also were reductions in mercury levels, but the reductions were lower.

The State of Pennsylvania found in a study in that state that mercury levels were significantly higher in areas of the state closer to coal-fired power plants.

A Northern Wisconsin study found “modest changes in acid rain or mercury deposition can significantly affect mercury bioaccumulation over short time scales.” A study found that mercury emissions from the Chicago/Gary urban area contributed significantly to mercury levels in Lake Michigan.

Based on EPA's Steubenville Hg Deposition Source Apportionment Study, conducted in 2002-2004, EPA concluded that approximately 70% of the wet mercury deposition near Steubenville, Ohio came from industrial plants in the area. The results of this study were not available to EPA when it promulgated CAMR. Although, industry representatives have asserted that this study is consistent with prior mercury deposition modeling by EPA and the Electric Power Research Institute (EPRI) that indicated that deposition of area emissions would occur in the Steubenville area but not in Montana, the EPA scientist conducting the study stated that his results appear to contradict findings of EPRI regarding transformation of ionic mercury into a form of elemental mercury that travels into the global mercury pool rather than remaining in a reactive form and being deposited locally. In any event, the Steubenville study results demonstrate that deposition in that area from nearby emission sources is significant. Also, the results of the Steubenville study are consistent with studies in several other states that have found a correlation between local mercury emissions and local mercury levels.

While much of the mercury emitted by Montana EGUs is elemental mercury that may not be deposited within the state, not all mercury emitted by Montana EGUs is in the elemental form, modeling has not demonstrated that no mercury emissions from Montana EGUs are deposited within Montana, and there is a reasonable likelihood that some mercury emissions from Montana EGUs are deposited within Montana.

Dr. David Krabbenhoft, a geochemist and the project leader for the U.S. Geological Survey's (USGS) National Mercury Project, has concluded that local mercury emissions contribute substantially to local deposition and that reducing mercury emissions in this country will reduce contamination of fish in the U.S.

Researchers in the METAALICUS study concluded that it takes only about three weeks from the time mercury is deposited on a lake to the point that methylation occurs and the mercury enters the food chain. A conclusion that can be drawn from this is that reductions in deposition could quickly result in a decrease in the level of mercury entering the food chain.

That strong control of mercury emissions from all EGUs across this country, including within the State of Montana, is necessary and appropriate is supported by EPA's findings and actions prior to issuing CAMR. On December 20, 2000, EPA published a Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units. 65 Federal Register 79,825. In that finding, EPA concluded that, based on EPA's February 1998 Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units--Final Report to Congress ("Utility RTC") and on information obtained by EPA since that time, a maximum achievable control technology (MACT) standard under Section 112 of the Federal Clean Air Act, for control of mercury emissions from EGUs, was necessary and appropriate. 65 Federal Register 79,826. EPA noted that a draft Utility RTC had been submitted for peer review in July 1995 and also had been made available at that time for public review, that EPA held a public meeting on July 11-12, 1995, to obtain comments from the scientific peer review panel, that EPA held a public outreach meeting on July 13, 1995, and that EPA finalized

and released the Utility RTC in February 1999. Id. EPA noted that it had found in the Utility RTC that mercury was the HAP emitted by EGUs that was of the greatest concern for public health. Id.

EPA noted in its December 20, 2000, finding that, to obtain further information, EPA had issued an information collection request (ICR) for all EGUs, requesting coal data for 1999 and that EPA required certain EGUs to conduct stack tests to evaluate HAP emissions. Id. EPA also solicited data from the public through a February 29, 2000, public notice, published in 65 Federal Register 10,783, and held a public meeting on June 13, 2000. 65 Fed. Reg. 79,826. In coordination with other parties, including DOE, EPA also evaluated the mercury control performance of various emission control technologies and funded NAS to perform an independent evaluation of the health impacts of methylmercury and provide recommendations for an EPA mercury RfD. Id. EPA noted that NAS conducted an 18-month study and provided a report to EPA in July 2000. Id.

Based on all of the information it gathered and obtained from the NAS study, EPA concluded in its December 2000 finding as follows:

> Mercury is highly toxic, persistent, and bioaccumulates in food chains.
> . . .
> As of July 2000, 40 States and American Samoa have issued fish advisories for mercury. Thirteen of those States have issued advisories for all water bodies in their State, and the other 27 States have issued advisories for over 1,900 specific water bodies. [Page 2 of the EPA Office of Inspector General's May 15, 2006, analysis of monitoring needed to assess the impact of CAMR on potential hotspots states that 44 states issued fish advisories for mercury in 2004 and that the number of mercury-related fish advisories continues to rise as states increase fish tissue testing.]
> . . .
> Also, of particular concern are subsistence fish-eating populations that may be consuming fish from contaminated water bodies. The EPA estimates that about 7 percent of women of childbearing age (*i.e.*, between the ages of 15 and 44 years) are exposed to methylmercury at levels exceeding its RfD of 0.1 microgram per kilogram body weight per day (0.1 ug/kg/day). The risk following exposures above the RfD is uncertain, but risk increases with increasing exposure. About 1 percent of women have methylmercury exposures 3 to 4 times the methylmercury RfD.
> . . .
> Electric utility steam generating units . . . are the largest source of mercury emissions in the U.S., estimated to emit about 30 percent of current U.S. anthropogenic emissions. There is a plausible link between emissions of mercury from anthropogenic sources (including coal-fired electric utility steam generating units) and methylmercury in fish. Therefore, mercury emissions from electric utility steam generating units are considered a threat to public health and the environment. It is acknowledged that there are uncertainties regarding the extent of the risks due to electric utility mercury emissions. For example, there is no

quantification of how much of the methylmercury in fish consumed by the U.S. population is due to electric utility emissions relative to other mercury sources (*e.g.*, natural and other anthropogenic sources). Nonetheless, the available information indicates that mercury emissions from electric utility steam generating units comprise a substantial portion of the environmental loadings and are a threat to public health and the environment. The EPA believes it is not necessary to quantify the amount of mercury in fish due to electric utility steam generating unit emissions relative to other sources for the purposes of this finding.
. . .
EPA estimates that the industry emitted 43 tons of mercury in 1999 from 1,149 units at 464 coal-fired plants.
. . .
For mercury, it was estimated in the utility RTC that the industry emitted approximately 46 tons in 1990 (51 tons in 1994) and was projected to emit approximately 60 tons in 2010 from 1,026 units at 426 coal-fired plants.
. . .
Neurotoxicity is the health effect of greatest concern with methylmercury exposure. Methylmercury has a relatively long half-life in the human body (averaging about 70 to 80 days). Dietary methylmercury is almost completely absorbed into the blood and distributed to all tissues including the brain; it also readily passes through the placenta to the fetus and fetal brain. The developing fetus is considered most sensitive to the effects from methylmercury; therefore, women of childbearing age are the population of greatest concern. Offspring born of women exposed to relatively high levels of methylmercury during pregnancy have exhibited a variety of developmental neurological abnormalities, including delayed developmental milestones, cerebral palsy, and reduced neurological test scores. Studies suggest that far lower levels of in utero exposures have resulted in delays and deficits in learning abilities. It is also possible that children exposed after birth are also potentially more sensitive to the toxic effects of methylmercury than adults because their nervous systems are still developing.
. . .
Exposure to methylmercury can have serious toxicological effects on wildlife as well as on humans. Adverse effects to avian species and wildlife have been observed in laboratory studies at levels corresponding to fish tissue methylmercury concentrations that are exceeded by a significant percentage of fish sampled in lake surveys. Generally, wildlife consume fish from a much more limited geographic area than do humans which can result in elevated levels of mercury in certain fish-eating species in localized geographic areas. Those species can include kingfisher, river otter, raccoon, loon, as well as some endangered species such as the Florida panther. [Kingfishers, river otters, raccoons, and loons all are found in Montana.]
. . . The EPA predicts that increased mercury deposition will lead to increased levels of methylmercury in fish, and that increased levels in fish will lead to toxicity in fish-eating birds and mammals, including humans. The NAS, in its July 2000 report, stated that "because of the beneficial effects of fish consumption, the long-term goal needs to be a reduction in the concentrations of

> methylmercury in fish." The EPA agrees with that goal and believes that reducing emissions of mercury from electric utility steam generating units is an important step toward achieving that goal.
> . . .
> Based on the results of the study documented in the utility RTC, as well as subsequent analyses and other available information, the Administrator has concluded that mercury is both a public health concern and a concern in the environment. The Administrator has concluded that there is a plausible link between methylmercury concentrations in fish and mercury emissions from coal-fired electric utility steam generating units. Although the degree to which that linkage occurs cannot be estimated quantitatively now, the facts are that: There is a linkage between coal consumption and mercury emissions; electric utility steam generating units are the largest domestic source of mercury emissions; and certain segments of the U.S. population (*i.e.*, the developing fetus, subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish.
> . . .
> It is appropriate to regulate HAP emissions from coal- and oil-fired electric utility steam generating units under section 112 of the CAA because, as documented in the utility RTC and stated above, electric utility steam generating units are the largest domestic source of mercury emissions, and mercury in the environment presents significant hazards to public health and the environment. The NAS study confirms that mercury in the environment presents significant hazards to public health.
> . . .
> It is necessary to regulate HAP emissions from coal- and oil-fired electric utility steam generating units under section 112 of the CAA because the implementation of other requirements under the CAA will not adequately address the serious public health and environmental hazards arising from such emissions identified in the utility RTC and confirmed by the NAS study, and which section 112 is intended to address.
> . . .
> <u>EPA . . . recognizes and shares concerns about the local impacts of mercury emissions and any regulatory scheme for mercury that incorporates trading or other approaches that involve economic incentives must be constructed in a way that assures that communities near the sources of emissions are adequately protected</u>.

<u>Id</u>., at 79,827, 79,828, 79,829, and 79,830. [Emphasis added.}

EPA's December 2000 finding, discussed above, supports comments in this rulemaking, and the finding of the board, that requirements beyond the minimum requirements set by EPA for compliance with the state mercury budgets established under CAMR protect, and mitigate harm to, public health or the environment. EPA found that mercury, and mercury emissions from EGUs, pose a significant risk to public health and the environment, that other requirements of the FCAA would not adequately address the

serious public health and environmental hazards posed by these emissions, that it was necessary and appropriate to regulate mercury emissions from EGUs as hazardous air pollutants, pursuant to Section 112 of the FCAA (which requires use of pollution control technology representing the maximum degree of reduction that is achievable), that EPA was concerned regarding local deposition of mercury from EGUs, and that a mercury emission allowance trading program is appropriate only if it is accompanied with protections against local deposition (such as stringent hard emission limits).

However, EPA did not promulgate a final MACT standard under Section 112 of the FCAA, which would have imposed stringent controls on all new or modified EGUs throughout the country, including Montana, but, instead, promulgated less stringent New Source Performance Standards (NSPS) under Section 111 of the FCAA, which EPA concluded in December 2000 was inadequate to address the serious public health and environmental hazards posed by mercury emissions from EGUs. EPA based its NSPS on the level of mercury control already being achieved with existing controls for criteria pollutants, such as sulfur dioxide and particulate matter. As part of CAMR, EPA provided a model emission trading program under which state mercury budgets can be exceeded through purchases of mercury emission allowances from out of state. This trading program, when combined with the lack of mercury emission limits for existing EGUs and emission limits for new EGUs set at levels that may not require mercury-specific emission control, fail to provide the protections against local deposition earlier found by EPA to be necessary. On the other hand, while the Board's mercury rules allow trading of emission allowances, they can protect, and mitigate harm to, public health and the environment by imposing stringent emission limits for new and existing EGUs that cannot be exceeded, except when an alternative emission limit has been shown to be necessary.

EPA's Office of Inspector General (OIG) found that, in developing its mercury regulations, EPA's senior management had instructed staff to arrive at a predetermined national level of reduction, based on the amount of mercury reductions expected to be achieved under other regulations, instead of basing the regulations on an unbiased determination of the level of reduction being achieved in practice by the top performing units. OIG concluded that, based on the manner in which the proposed MACT standard and alternative proposed cap-and-trade program were developed, EPA had not provided a reasonable basis for determining which approach would provide the better cost-benefit. OIG also concluded that EPA had failed to adequately address the potential for mercury hot spots and the impact of the rules on children's health.

The chair of EPA's Children's Health Protection Advisory Committee concluded in January 2004 that EPA's cap-and-trade proposal might not sufficiently protect the nation's children from mercury hot spots and may result in new hot spots. She stated in a January 26, 2004, letter to the EPA Administrator that: ". . . EPA should take into consideration the findings in studies showing that reducing mercury air emissions has a positive impact on local mercury levels such as demonstrated in the Florida Everglades and other studies."

In addition to the mercury reductions achieved in-state under the Board's mercury rules, reducing mercury emissions from Montana EGUs also may encourage other states and countries to do the same. Reductions in other states and around the world that may be stimulated by reductions in Montana also would protect, and mitigate harm to, public health and the environment in Montana, given the global nature of mercury deposition.

It's also reasonable to conclude that reduced mercury deposition in other states and other parts of the world from reductions in mercury emissions in Montana would protect, and mitigate harm to, the public health of Montanans who consume fish from other states and other parts of the world or who travel to other states and other parts of the world and consume fish and other foods from those places.

The Board's mercury rules can protect, and mitigate harm to, public health and the environment by requiring existing EGUs to implement mercury-specific control strategies and, thereby, reduce mercury emissions and deposition from those EGUs below past levels. For new EGUs, future mercury emissions and deposition will be mitigated by the Board's mercury rules below the levels that would occur with less stringent restrictions.

The Requirements in the Rules Adopted by the Board Are Achievable with Current Technology.

The requirements of the Board's mercury rules are achievable with current technology. The monitoring, recordkeeping, and reporting requirements in the Board's mercury rules are EPA's requirements. The Board's mercury rules include emission limits for both existing and new EGUs, while EPA's emission limits would apply only to new EGUs. Also, EPA's limits were not intended by EPA to impose any additional control requirements (although, EPA expected the lower 2018 state mercury budgets to require additional control at some EGUs), whereas, the emission limits in the Board's mercury rules are intended to require implementation of mercury-specific control strategies starting in 2010, or upon commencement of commercial operation, whichever is later.

After listing EGUs under Section 112 of the FCAA, EPA's initial informal proposal in 2001 was for a MACT standard requiring 90% mercury control. The emission limits in the Board's mercury rules reflect approximately 80% and 84% control for subbituminous and lignite coal, respectively, although, control efficiency can fluctuate depending upon the constituents of each seam or load of coal.

The emission limit requirements adopted by the board include emission rates of 0.9 lb/TBtu, for EGUs not firing lignite coal, and 1.5 lb/TBtu for EGUs firing lignite, both calculated as a rolling 12-month average. The Board's mercury rules require implementation of a mercury control strategy by January 1, 2010, or at commencement of commercial operation, whichever is later. If an EGU fails to meet the applicable emission limit, the owner or operator may apply to the Department for an alternative emission limit (AEL), up to 4.8 lb/TBtu, depending upon the date of commencement of commercial operation and coal type. The Board's mercury rules also require a periodic

best available control technology (BACT) review. However, BACT requirements do not require emission control greater than the level being achieved in practice by a similar facility.

The 0.9 lb/TBtu emission limit applicable to subbituminous-fired EGUs and the 1.5 lb/TBtu emission limit applicable to lignite-fired EGUs represent the level of mercury reduction necessary to achieve compliance with the 2018 state mercury budget of 298 pounds by the existing EGUs, permitted EGUs that have not begun commercial operation, and the Highwood Generating Station, for which the department has issued a draft air quality permit. The 1.5 lb/TBtu emission limit applicable to lignite-fired EGUs reflects the relative difficulty of controlling mercury emissions and the higher concentration of mercury from other coal types compared to the difficulty of controlling mercury from subbituminous coal.

Requiring mercury control strategies projected to meet the 2018 budget, along with provisions for obtaining an AEL, if necessary, rather than phasing in emission limits, will facilitate better planning by owners and operators respecting the control configurations necessary to meet the ultimate goal of compliance with the 2018 budget. Also, the 0.9 lb/TBtu and 1.5 lb/TBtu emission limits will require some level of mercury control on every EGU in the state by 2010, which will better protect, and mitigate harm to, public health and the environment than delaying implementation of control technology until 2018.

The rolling 12-month averaging period provides flexibility, by allowing averaging of EGU emissions over a rolling 12-month time period, rather than over a shorter period such as one-hour. This allows a facility to average out any spikes in emissions caused by variability in mercury concentrations and plant operations.

Among other mercury control practices, mercury control technologies and combustion processes that can reduce mercury emissions from EGUs, and that are applicable to the subbituminous and lignite coals fired in Montana include: boiler technologies; particulate, sulfur dioxide and nitrogen oxide controls, such as fabric filters, electrostatic precipitators (ESPs), flue gas desulferization systems, and selective catalytic reduction (SCR); activated carbon injection (ACI); enhanced ACI, using brominated halogens and coal and flue gas chemical additives that promote mercury oxidation; pre-combustion fuel treating, such as the KFx coal treatment process; and coal blending. In general, it is more difficult to capture mercury from EGUs firing western subbituminous and lignite coals than it is to capture mercury from EGUs firing bituminous coal, because of the higher levels of elemental mercury in western subbituminous and lignite coals, which is associated with lower chlorine content. However, reductions of mercury from those coal types greater than 90% are being achieved.

Several commenters stated that new EGUs could meet emission limits equal to, or more stringent than, those adopted by the Board, using integrated gasification combined cycle (IGCC) combustion technology. Also, sulfur- impregnated activated carbon beds can increase mercury capture in the IGGC process.

The KFx coal treatment process upgrades high moisture subbituminous and lignite coals into a higher energy, lower moisture fuel, called K-Fuel, making the coal comparable to many eastern coals. According to KFx, Inc., this process, by itself, results in an average mercury reduction of 70%, in addition to reducing sulfur dioxide and nitrogen oxide emissions. When combined with other pollution controls, such as existing controls for particulate, sulfur dioxide, and nitrogen oxides, which also control some amount of mercury, use of K-Fuel can result in mercury reductions greater than 70%. K-Fuel also may be blended with other coals. Adverse balance of plant impacts are not expected with this process. The initial KFx facility will be located near Gillette, Wyoming and will process mostly local Powder River Basin (PRB) subbituminous coal.

ACI has been used commercially for many years to reduce mercury emissions from municipal solid waste incinerators, and ACI appears to be one of the more promising technologies for controlling mercury from EGUs. The owners and operators of several EGUs in the western U.S. have agreed to install ACI. Centennial Power, Inc./Rocky Mountain Power, the owners of the Hardin Generating Station have agreed to install ACI or an equivalent technology, as may be approved by the Montana Department of Environmental Quality.

Some impacts to long-term facility operations from using ACI, such as impacts on particulate control devices and impacts on ability to sell or dispose of fly ash, are unknown. These impacts appear to mainly relate to potential additional costs and adjustments in operation, rather than technical feasibility. However, technical feasibility will continue to be evaluated during long-term testing of ACI.

DOE has been involved in field testing of mercury control technologies since 2001. Other entities, such as ADA Environmental Solutions, Sorbent Technologies, the University of North Dakota Energy & Environmental Research Center, URS Group, Inc., and Amended Silicates, LLC, also have conducted extensive testing of mercury control technologies. Demonstrations with ACI and brominated carbons at EGUs firing low-chlorine coal have achieved mercury emission rates of less than 1.0 lb/TBtu, and ACI now is commercially available for use by any EGU. While control efficiencies have varied widely in some tests, mercury reductions of 90% and greater are being achieved in field testing of both subbituminous and lignite coals.

PPL-Montana commented that it may be able to achieve 90% mercury removal at its Colstrip facility with a fabric filter retrofit, using oxidizer treated ACI. PPL also commented that it may be able to achieve up to a 70% reduction using only the KFx coal treatment process, and this level of reduction was confirmed in comments by KFx, Inc.

PPL commented that, regarding mercury control at its J.E. Corette facility, using chemically treated ACI upstream of an ESP has enabled some EGUs firing PRB coal to achieve 90% mercury control. PPL also commented that the Toxecon process, which uses a pulse-jet fabric filter downstream from an ESP and injects ACI into the flue gas after the ESP but upstream of the fabric filter, may achieve 90% mercury control.

In response to requests from its members after promulgation of CAMR, the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) developed a model mercury control rule that would require all new EGUs to implement state of the art mercury control technology and update that technology on a periodic basis. The model rule includes two options for existing EGUs. Option 1 would require 80% control (average of in-state units), or compliance with an emission limit of 0.01 lb/GWh (average of in-state units), by 2009 and 90-95% control (plant site average.), or compliance with an emission limit of 0.0060 – 0.0025 lb/GWh (plant site average) by 2012. Option 2 would require existing EGUs to achieve 50% mercury reduction by the end of 2009 and 90-95% control, or compliance with an emission limit of 0.0060 – 0.0025 lb/GWh, by 2013.

Several eastern and mid-western states have enacted legislation, adopted rules, or proposed rules requiring mercury reductions greater than the reductions directly required by CAMR and, in some cases, without allowing interstate trading of emission allowances. Some of those states' statutes and rules are as follows:

> Connecticut – Enacted a statute that does not allow participation in the national emission trading program and requires 90% control efficiency or compliance with a limit of 0.6 lb/TBtu by 7/1/2008, with provision for an AEL, if necessary;
>
> Illinois - The governor has requested that the Illinois Environmental Protection Agency develop rules requiring 75% individual plant reductions by June 2009 and 90% reductions by 2012, without participation in the national emission trading program;
>
> Maryland – Enacted a statute requiring reductions of 80% by 2010 and 90% by 2013, with no participation in the national emission trading program;
>
> Massachusetts - Adopted a rule requiring 85% control efficiency, or compliance with an emission limit of 0.0075 lb/GWh, by 2008 and 95% control efficiency, or compliance with an emission limit of 0.0025 lb/GWh, by 10/1/2012, with no participation in the national emission trading program;
>
> Michigan - The governor has proposed to require 90% reductions by 2015, without participation in the national emission trading program; and
>
> New Jersey – Adopted a rule requiring 90% control efficiency, or compliance with an emission limit of 3 mg/MW-hr, by 12/15/2007.

While the coal fired in these states, and the mercury content and mercury species of the coal fired in these states, would differ from the coal fired in Montana, these statutes and rules indicate that legislatures and health and environmental protection authorities in other states believe that control efficiencies beyond the control efficiencies required

under CAMR's model emission allowance trading rule are technically achievable and appropriate.

The 0.9 lb/TBtu and 1.5 lb/TBtu emission limits required in the Board's mercury rules are currently achievable for the subbituminous and lignite coals fired by Montana EGUs. Further, the emission limit requirements in the rules do not take effect until January 1, 2010. Also, in 2010, or at commencement of commercial operation, whichever is later, the requirement is to implement a mercury control strategy that is projected, as determined by the Department, to achieve compliance with the applicable limit, and the owner or operator of an EGU may obtain a higher AEL if that strategy fails under normal operation to meet the required emission rate. The maximum AELs specified in the rules range from 1.5 lb/TBtu, for new nonlignite-fired EGUs, to 4.8 lb/TBtu, for existing lignite-fired EGUs. The record also demonstrates that these emission limits are currently achievable.

Peer-Reviewed Scientific Studies in the Record that Form the Basis for the Board's Conclusion

Commenters referred the board to numerous scientific studies related to the public health and environmental impacts of mercury, mercury deposition, testing of mercury control technology, and other related matters that formed the basis for the Board's decision in this rulemaking. For most of the studies, the commenters and documentation in the record regarding the studies do not identify whether the studies have been peer-reviewed. The studies cited by commenters are too numerous to list in this document; however, studies that formed the basis for the Board's decision, including those studies identified in the record as having been peer-reviewed, are listed below. Where the record indicates that a study has been peer-reviewed, that is noted.

Cohen at al., Modeling the Fate and Transport and Deposition of Atmospheric Mercury to the Great Lakes (2004).

Faroe Islands and Seychelles Islands Epidemiological Studies.

Florida Department of Environmental Protection, "Integrating Atmospheric Mercury Deposition with Aquatic Cycling in South Florida (November 2003)".

Grandjean, et al., "Cardiac Autonomic Activity in Methylmercury Neurotoxicity 14-year follow-up of a Faroese Birth Cohort." (peer-reviewed)

Harvard University Center for Risk Analysis, Economic Evaluation of Human Health Benefits of Controlling Mercury Emissions from U.S. Power Plants.

Hightower, et al Study of Mercury Exposure in Adults.

Mahaffey, et al., "Blood Organic Mercury and Dietary Mercury Intake: National Health and Nutrition Examination Survey" (1999 and 2000).

Mount Sinai School of Medicine's Center for Children's Health and the Environment study. (peer-reviewed)

Murata, et al., "Delayed brainstem auditory evoked potential latencies in 14-year-old children exposed to methylmercury." (peer-reviewed).

National Health and Nutrition Examination Study.

Palmer, et al., "Environmental mercury release, special education rates, and autism disorder; an ecological study in Texas." (peer-reviewed).

Rimmer, et al., "Mercury Concentrations in Bicknell's Thrush and Other Insectivorous Passerines in Montane Forests of Northwestern North America (2005).

Schlober, et al., "Blood mercury levels in US children and women of childbearing age, 1999-2000."

Stern, et al. Study of Mercury Exposure in Pregnant Women.

Keeler, et al., "Sources of Mercury Wet Deposition in Eastern Ohio, USA." (peer-reviewed)

University of North Carolina's Environmental Quality Institute Hair Sampling Study Interim Report (February 2006) .

U.S. EPA Study of Hazardous Air Pollutant Emissions from Electric Steam Generating Units: Final Report to Congress, EPA-453/R-98-004A ("Utility Report to Congress"). (peer-reviewed)

Virtanen, et al., "Fish Oils, and Risk of Acute Coronary Events and Cardiovascular Disease, Coronary Heart Disease, and All-Cause Mortality in Men in Eastern Finland (2005).

Information from the Record Regarding Costs to the Regulated Community That Are Directly Attributable to the Board's Mercury Rules

It is difficult to determine the costs to the regulated community that will be directly attributable to the Board's mercury rules. CAMR will impose costs on the regulated community by requiring owners or operators to either implement mercury emission control practices and/or purchase mercury emission allowances to emit mercury above a facility's allocated emission allowances. These are costs that will be borne by the regulated community pursuant to any option a state elects to comply with its mercury budget established pursuant to CAMR and are costs that are not directly attributable to the option elected by the state. However, the mercury emission limits and allowance scheme adopted by the board may require the owners or operators of certain existing and

new EGUs to implement mercury control practices and/or purchase mercury emission allowances that would not be required pursuant to the CAMR model rule.

> The Department prepared an economic impact statement for this rulemaking, which is in the record of this proceeding. That statement is over 40 pages. Due to the length of that statement, the Board incorporates that statement by reference into this finding.

The following is specific information from the record regarding costs to the regulated community directly attributable to the Board's mercury rules:

Activated Carbon Injection (ACI) Costs: The U.S. DOE calculated the following costs for ACI, based on field testing:

> Holcomb Station Unit 1 (90% control, firing subbituminous coal) - $6,060 per pound of mercury removed, on a 20-year levelized and incremental cost basis, without considering impacts to byproducts; $18,000 per pound of mercury removed, considering impacts to byproducts.
>
> Meramec Station Unit 2 (90% control, firing subbituminous coal) - $17,700 per pound of mercury removed, on a 20-year levelized and incremental cost basis, without considering impacts to byproducts; $42,500 per pound of mercury removed, considering impacts to byproducts.
>
> Stanton Station Unit 10 (70% control, firing lignite coal) - $17,400 per pound of mercury removed, on a 20-year levelized and incremental cost basis, without considering impacts to byproducts; $47,300 per pound of mercury removed, considering impacts to byproducts.

The Montana Environmental Information Center (MEIC) stated in its petition for the Board to initiate this rulemaking proceeding that the capital cost of ACI for a 500-megawatt EGU has been estimated at less than $1.5 million. MEIC stated that annual operating costs vary but have been estimated to be $1 million to $2 million for the sorbent materials for an EGU with a fabric filter and $2 million to $3 million for an EGU with an ESP. MEIC stated that this compares to the following recently estimated pollution control costs for the 780-megawatt Roundup Power Project:

> Particulate - $32 million to $36 million in capital costs and $8,126,000 in annual operating costs;
>
> Sulfur Dioxide - $150 million to $200 million in capital costs and $22,658,000 in annual operating costs;
>
> Nitrogen Oxides - $48 million to $64 million in capital costs and $11,044,000 in annual operating costs.

Another commenter stated that the capital cost of ACI for a 500 megawatt EGU would be $984,000 and that annual operating costs, for operation 80% of the time, would be $3.4 million. The commenter stated that the additional costs for installing a fabric filter would be $28.3 million in capital costs and $2.6 million in annual operating costs.

Requiring Compliance with Hard Emission Limits: The record indicates that requiring all EGUs to comply with stringent mercury emission limits that cannot be exceeded using emission credit allowances may require the owners or operators of Montana EGUs to spend money to implement mercury-specific control technology, as opposed to potentially spending less money to purchase mercury emission allowances from other facilities to finance the entire cost of compliance.

Impacts of Controlling Mercury Emissions on Fly Ash and Bottom Ash Sales and Ash Disposal Costs: The record includes information that increased control of mercury may result in increased mercury in fly ash and bottom ash. Requiring greater mercury control at all EGUs, as opposed to allowing EGUs to purchase mercury emission allowances and emit at the level of allowances purchased, may result in greater mercury and/or carbon content in the ash, adversely affecting ability to sell the ash for uses such as for a constituent of cement. Owners or operators of EGUs who cannot sell ash for a beneficial purpose may be required to dispose of the ash as a non-hazardous waste or pay higher disposal costs if the ash is determined to constitute a hazardous waste.

According to the DOE's National Energy Technology Laboratory Phase II Mercury Control Field Testing Program and its April 2006 Preliminary Economic Analysis of ACI, the total byproduct impacts from injecting activated carbon upstream of an ESP are estimated to be $35 per ton of ash produced, including $18 per ton for lost revenue from fly ash sales and $17 per ton for non-hazardous fly ash disposal. This may be a worst case scenario, and byproduct impacts may not be as high for EGUs equipped with spray dry absorbers and fabric filters because the majority of byproducts from spray dry absorbers are used for low value mining applications, generally, as fill material. For these byproducts, the only cost of contamination would be the $17 per ton disposal cost because there would be no lost revenue from sales.

Presently, PPL sells all of the fly ash from its Corette facility for use in concrete. PPL sells some bottom ash from the Colstrip facility but disposes of all fly ash onsite.

KFx Pre-Combustion Process: KFx, Inc., provided information stating that KFx-treated coal will be sold by the ton at an estimated cost of $23-26 per ton and that this cost will be competitive with other high BTU, low sulfur coals.

Montana-Dakota Utilities Company Lewis and Clark Station Retrofit: MDU commented that the cost to retrofit its Lewis and Clark Station to meet the requirements of the Board's mercury rules most likely would be higher on a relative basis (per MW or per pound of mercury removed) than the cost to retrofit the PPL Colstrip facility, due to the economies of scale.

PPL-Montana Colstrip Facility - Fabric Filter Retrofit: PPL commented that it would cost approximately $250 million to retrofit the Colstrip facility with fabric filter technology, which might be necessary to meet the applicable emission limit required under the Board's mercury rules. PPL commented that it might cost approximately another $250 million to address balance of plant impacts resulting from the retrofit.

PPL-Montana J.E. Corette Facility - Toxecon Process: PPL commented that the capital cost of using the Toxecon process, which would involve addition of a pulse-jet fabric filter downstream of the J.E. Corette facility's ESP, and addition of chemically treated activated carbon after the ESP, but upstream of the fabric filter, would be approximately $17 million, which does not include the costs of addressing any balance of plant impacts.

PPL-Montana J.E. Corette Facility – ACI: PPL estimated the capital cost for ACI at the J.E. Corette facility to be $855,000. PPL commented that operating costs could be very high, depending on the price of activated carbon and disposal costs for fly ash.

Additional cost information submitted by commenters is found in the following documents in the record that are too lengthy for incorporation and that are, therefore, incorporated by reference into this finding:

> "The Cost of Mercury Removal in an IGCC Plant, Final Report, "September 2002, Prepared for the DOE National Energy Technology Laboratory. (23 pages)
>
> "An Evaluation of the Uncertainties Associated with Mercury Emissions Reductions," July 5, 2006, Prepared for PPL Montana, LLC by URS. (51 pages)
>
> "An Evaluation and Empirical Analysis of a National Cap-and-Trade Program to Reduce Montana Mercury Emissions," Prepared for PPL Montana, LLC by NERA. (41 pages)
>
> Written Testimony of Northwestern Energy and appendices. (10 pages)
>
> Institute of Clean Air Companies Comments to EPA, January 3, 2005, "Post Combustion Control Technologies." (12 pages)
>
> Sorbent Technologies Corporation Comments to EPA, December 30, 2004, "The Current State of Activated Carbon Injection Technology." (18 pages)
>
> "Accumulated Power-Plant Mercury-Removal Experience with Brominated PAC Injection," Prepared by Sorbent Technologies Corporation. (12 pages)
>
> "Enhancing Carbon Reactivity in Mercury Control in Lignite-Fired Systems," Prepared by EERC. (21 pages)